WHAT IS CLAIMED IS:

1. A heterostructure, comprising:

a first semiconductor layer;

a second semiconductor layer; and

an intermediate semiconductor layer sandwiched between the first and second semiconductor layers and forming first and second heterointerfaces respectively therewith, wherein the first and second heterointerfaces are characterized by respective polarization charge regions producing a polarization field across the intermediate semiconductor layer promoting charge carrier tunneling through the intermediate semiconductor layer.

2. The heterostructure of claim 1, wherein the intermediate semiconductor layer has a thickness (D) enabling charge carriers to tunnel through the intermediate semiconductor layer with a current density greater than 1 A/cm^2.

3. The heterostructure of claim 2, wherein the polarization field has a magnitude (ξ_p) on the order of $(E_{c,1}-E_{v,2})/(q \cdot D)$, wherein $E_{c,1}$ is a relative conduction band energy at the first heterointerface, $E_{v,2}$ is a relative valence band energy at the second heterointerface, q is a unit carrier charge, and D is the thickness of the intermediate semiconductor layer.

4. The heterostructure of claim 2, wherein the polarization field has a magnitude (ξ_p) sufficient to align conduction band states at the Fermi level at the first heterointerface with valence band states at the Fermi level at the second heterointerface.

5. The heterostructure of claim 1, wherein the first semiconductor layer is doped n-type and the second semiconductor layer is doped p-type.

6. The heterostructure of claim 5, wherein the polarization field enhances a dopant-induced drift field produced between the first and second semiconductor layers.

7. The heterostructure of claim 1, wherein the first and second semiconductor layers are formed from the same semiconductor material.

8. The heterostructure of claim 7, wherein the first and second semiconductor layers are formed from GaN and the intermediate semiconductor layer is formed from AlGaN.

9. The heterostructure of claim 7, wherein the first and second semiconductor layers are formed from GaN and the intermediate semiconductor layer is formed from InGaN.

10. The heterostructure of claim 1, wherein the first, second and intermediate semiconductor layers are characterized by crystallographic structures allowing spontaneous polarization charge formation at the first and second heterointerfaces.

11. The heterostructure of claim 10, wherein each of the first, second and intermediate semiconductor layers has a hexagonal crystallographic structure.

12. The heterostructure of claim 10, wherein each of the first, second and intermediate semiconductor layers is formed from a III-V nitride semiconductor material.

13. The heterostructure of claim 12, wherein each of the first, second and intermediate semiconductor layers is formed from a semiconductor material selected from the group consisting of: GaN, AlGaN, InGaN, AlN, InN, InAlN.

14. The heterostructure of claim 10, wherein each of the first, second and intermediate semiconductor layers is formed from a II-VI semiconductor material.

15. The heterostructure of claim 1, wherein each of the first and second heterointerfaces is characterized by a substantial piezoelectric charge formation.

16. A heterostructure, comprising:

a semiconductor structure having a p-type region; and

a tunnel contact structure disposed between the p-type region of the semiconductor structure and an adjacent n-type region, wherein the tunnel contact structure includes,

a first semiconductor layer coupled to the n-type region and doped n-type,

a second semiconductor layer coupled to the p-type region of the semiconductor structure and doped p-type, and

an intermediate semiconductor layer sandwiched between the first and second semiconductor layers and forming first and second heterointerfaces respectively therewith, wherein the first and second heterointerfaces are characterized by respective polarization charge regions producing a polarization field across the intermediate semiconductor layer promoting charge carrier tunneling through the intermediate semiconductor layer.

17. The heterostructure of claim 16, wherein the semiconductor structure comprises a light emitting region.

18. The heterostructure of claim 16, wherein the intermediate semiconductor layer has a thickness (D) enabling charge carriers to tunnel through the intermediate semiconductor layer with a current density greater than 1 A/cm^2.

19. The heterostructure of claim 18, wherein the polarization field has a magnitude (ξ_p) sufficient to align conduction band states at the Fermi level at the first heterointerface with valence band states at the Fermi level at the second heterointerface.

20. The heterostructure of claim 16, wherein each of the first, second and intermediate semiconductor layers is formed from a III-V nitride semiconductor material or a II-VI semiconductor material.